


AUTOMOTIVE
Light Metal Alloys
15_AUTO_LMA_DIJOALS

Title: Dissimilar joining of metallic components for serial applications.

Description: Dissimilar joining of:

- aluminum-steel
- Steel- composite
- Aluminum- composite for serial applications.

Dissimilar joining can be possible with only possible with screw and nut and some rivets technology in serial productions.

These have some limitations; therefore, we need alternative solutions:

- More aesthetic
- Faster
- Cheaper
- Lighter

Objectives:

- Increasing the lightweight material on vehicle
- Give design convenience to designer
- Faster, more reliable and lighter joining
- Less heat generating during joining (like arc welding)

Challenges:

- Dissimilar joining without extra fastener usage (no screw, no nut) or very small low cost elements. Constraint: the mechanical properties of the joining area must be bigger than the lowest properties of sheet metal in the mechanical structure.

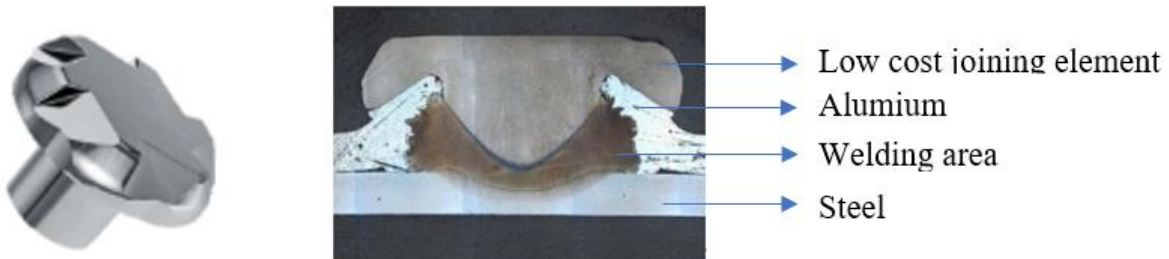


Figure 1: Example of low cost element

- Joining without pre-readiness (hole opening, nut welding etc.), for current solutions, we need to make extra operations for joining. Opening holes, welding nuts, tuckers



etc. We are looking to eliminate opening holes, welding nuts, tuckers etc, and create easy assembly ways. Example: self-drilling screws



Figure 2: Self drilling screws

- We want to use hole expansion index properties to create a nut with sheet material itself. We want to create a norm about it



Figure 3: Hole expansion index



16_AUTO_LMA_E-carGEAR

Title: Light metal alloys for e-car gearbox

Summary: Light weight alloy (or as more challenging alternative fibre reinforced polymers) with noise reduction characteristics to be utilized to realize e-car gearbox and differential housings. Possible application extension (depending on production cost) also on industrial gearboxes. Start TRL4/5, end TRL7

Description:

New e-vehicle will require a big attention to weight, to improve the overall efficiency of the vehicle, penalized by the big mass of the battery pack. Innovative solution will be necessary either to reduce the weight of the vehicle transmission (gearbox and differential) or to reduce NVH (in particular, noise) due to the fact that to improve e-motors performances their max speed is already above 20K rpm. Innovative solutions can identify new material that can replace aluminum/cast iron die casting and that could be more efficient in terms of NVH and weight, i.e., composite material with sandwich structure. Obviously, cost could be another important driver.

Please note that the challenge doesn't consider battery pack production, as the reference on battery pack is only to remind that the e-vehicle with heavy BP, could need to improve their weight but on other components (like transmission or other components).

New materials and production technologies will be necessary to take up this challenge

Objectives:

- Objective n.1: alternative material/solution to aluminum housing of a gearbox, with a weight reduction at least of 30% and a cost increase not higher than 10%. As output of the Project a sample of gearbox/ generic housing, to show weight reduction at same mechanical overall performances.
- Objective n.2: improve NVH emission by at least 30-50% with a laboratory simulation at different frequencies.